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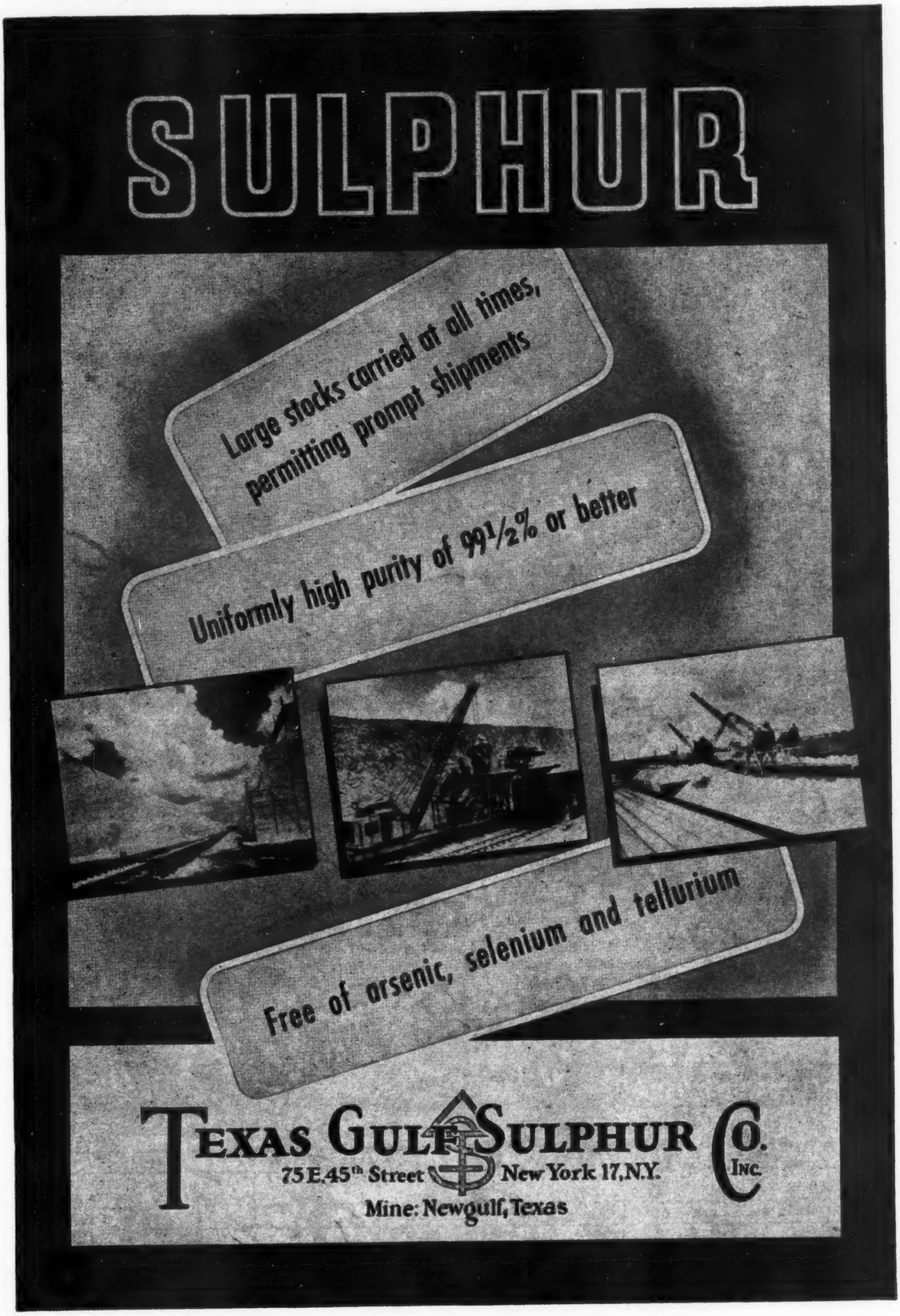
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The American FERTILIZER

Vol. 108 FEBRUARY 7, 1948 No. 3

Use of Natural Organics in Mixed Fertilizers*

By K. G. CLARK[1] and FIRMAN E. BEAR[2]

IN THE early stages of development of the mixed fertilizer industry, during the latter half of the 19th century, sources of nitrogen for fertilizer use were limited largely to organic waste materials of domestic origin and Chilean nitrate of soda. The domestic materials consisted mainly of oil seed meals, packing house byproducts, and various animal manures in which the nitrogen was present principally in water-insoluble proteinaceous form. The time required for the decomposition of organic materials in the soil with conversion of their nitrogen to soluble form led to their classification as slowly available forms in contrast to the more readily soluble nitrogen in the imported material.

The demand for fertilizer nitrogen paralleled the increase in chemical nitrogen that became available from developments involving the production of ammonium sulfate as a byproduct of the coke industry, and the establishment of successful processes for the fixation of atmospheric nitrogen. As a result the natural organics available for the formulation of mixed goods were in relatively short supply. At the same time the demand for certain of the better grade organics for use in stock feed at higher price levels so intensified the situation that it became common practice to include inert organic materials in mixtures for their conditioning effect, and to limit the use of the more active organics to formulation of premium grades and special mixtures. Such materials and mixtures are valued particularly for their content of water-insoluble nitrogen on the basis of their resistance to loss by leaching from sandy soils in regions of high rainfall and their gradual release of nitrogen to the crop throughout the growing season.

Trends in the Usage of Natural Organics

Seed meals used in the manufacture of mixed fertilizers more than doubled in volume in the period between 1900 and 1909 as shown by the data in Table 1. By 1939 usage had decreased to about 90 per cent of the 1900 figure and was still lower in 1944 under wartime conditions.

Animal products including animal tankage, dried blood and fish scrap, generally among the most highly regarded of the natural organics, increased about 50 per cent in volume between 1900 and 1919, but declined to less than one-third of the latter value by 1939 and to only three per cent of it in 1944. The decline in these two classes of materials is attributable to the more attractive markets for cottonseed meal, dried blood, animal tankage, and fish scrap as stock feed.

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*A paper presented at the Fertilizer Conference held at Beltsville, Maryland, January, 1947.

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Garbage tankage is an outstanding example of a material for which no more profitable market developed but which declined in popularity as a result of its low nitrogen content, 2.5 to 3 per cent, and generally inferior quality.

The increase in the use of plant materials and peat undoubtedly is due more to their conditioning properties than to their value as sources of nitrogen.

Process tankage and sewage sludge increased in importance as sources of water-insoluble nitrogen during the war as a direct result of government restriction on the use of certain seed meals and animal products as fertilizer. The former materials along with castor pomace were the only natural organic sources of nitrogen on which the Office of Price Administration established ceiling-prices for fertilizer use.

The tonnage of process tankage, seed meals, and sewage products amounted to 60 per cent of the total organics used in mixtures in 1944, but these materials supplied 31, 29, and 21 per cent, respectively, or a total of 81 per cent of the natural organic nitrogen. Plant materials and peat accounted for one-third of the tonnage of materials but they supplied

TABLE 1

NATURAL ORGANICS USED IN THE MANUFACTURE OF MIXED FERTILIZERS[1]

Materials	Nitrogen availability[2]	Tonnage of material 1900	1909	1919	1929	1939	1944	Equivalent nitrogen 1944
	Per cent	Short tons						
Seed meals[3]	54–67	151,000	367,000	269,000	197,000	139,000	130,000	7,900
Animal products[4]	45–68	209,000	227,000	300,000	158,000	95,000	9,000	800
Process tankage	18–37	......	......	10,000	126,000	93,000	105,000	8,700
Garbage tankage	–3	103,000	150,000	116,000	110,000	31,000	15,000	450
Sewage products	16–53	......	......	......	24,000	57,000	115,000	6,000
Manures	7–77	......	......	33,000	29,000	35,000	25,000	750
Plant materials[5]	5–15	10,000	15,000	61,000	103,000	145,000	145,000	2,800
Peat	4	......	10,000	25,000	40,000	40,000	40,000	600
Total	..	473,000	769,000	814,000	787,000	632,000	584,000	28,000
Equivalent N	..	32,300	42,000	49,200	36,300	31,100	28,000	28,000
Average nitrogen content, %	..	6.8	5.5	6.0	4.6	4.9	4.8	..
Average availability, %[2]	..	52.3	53.1	52.9	44.4	42.6	39.2	39.2

[1] SOURCES: 1900–1929 Yearbook of Commercial Fertilizer. 1939. Better Crops wih Plant Food 26 (1): 20–22, 40–42, 1942. 1944. Agricultural Statistics 1946, p. 593.

[2] Based on data of Rubins and Bear, Soil Sci. 54 (6): 411–423, 1942.

[3] Apricot seed meal, castor pomace, cottonseed meal, hempseed meal, linseed meal, rape seed meal, soybean meal, tung meal, etc.

[4] Animal tankage, dried blood, fish scrap, hoof and horn meal, and miscellaneous organics.

[5] Cocoa byproducts, peanut hull meal, and tobacco stems.

TABLE 2

CONSUMPTION OF NITROGEN IN COMMERCIAL FERTILIZER AND PORTION DERIVED FROM NATURAL ORGANIC SOURCES[1]

Year	Total nitrogen in commercial fertilizer	Natural organic sources: Total — Nitrogen	Total — Portion of total N	Used in mixtures — Nitrogen	Used in mixtures — Portion of total N in mixtures	Used as separate materials — Nitrogen	Used as separate materials — Portion of total N in separate materials
	Tons	Tons	Per cent	Tons	Per cent	Tons	Per cent
1900	72,000	63,100	87.6	32,300	91.1	30,800	84.2
1909	125,000	67,300	53.8	42,000	67.7	25,300	40.2
1919	219,000	76,200	34.8	49,200	53.6	27,000	21.2
1929	352,000	58,500	16.6	36,300	22.0	22,200	11.9
1939	398,200	48,000	12.1	31,100	15.2	16,900	8.7
1944	634,500	33,000	5.2	28,000	8.3	5,000	1.7

[1] Compiled largely from "Consumption and trends in the use of fertilizers in the year ended June 30, 1944." Mehring, A. L., Wallace, H. M., and Drain, M., U. S. Dept. Agr. Cir. 756.

only 10 per cent of the nitrogen. Although the tonnage of natural organics exceeded that in 1900 by nearly 25 per cent, the nitrogen derived from these sources was 13 per cent less owing to the decrease in average nitrogen content from 6.8 to 4.8 per cent.

The efficiency with which nitrogen from the different organics is effective in promoting crop growth, based on the crop response data of Rubins and Bear[3], is shown in column two of the table. From this it is apparent that plant materials, peat, and garbage tankage are very inferior sources of nitrogen. Using these availability factors the average availability of natural organic nitrogen in mixtures is estimated to have decreased from 52 to 53 per cent in the period 1900–1919 to 39 per cent in 1944, or about 25 per cent. Thus the decrease in the average nitrogen content of the organics has been accompanied by a nearly proportionate decrease in their quality.

In 1900 nitrogen from natural organic sources supplied more than 90 per cent of the nitrogen in mixtures and seven-eighths of the nitrogen in all commercial fertilizers. By 1939 the situation had been reversed, as shown by the data of Table 2 to the extent that chemical nitrogen then supplied 85 per cent of the nitrogen in mixtures and seven-eighths of the total nitrogen. In 1944 natural organics supplied only 8 per cent of the nitrogen in mixtures and 5 per cent of the total.

In 1900 natural organics supplied nearly as much nitrogen in separate materials as in mixtures, but in 1944 more than five-fifths of the supply was used in mixtures.

In spite of the major changes that occurred in the formulation of mixed fertilizers in the period 1900 to 1944, the nitrogen supplied by natural organics varied only from 32,000 tons in 1900 to 49,000 in 1919 and 28,000 in 1944. Chemical nitrogen sources supplied 3,100 tons in 1900 and 100 times as much, or 309,500 tons, in 1944. In the same period the total consumption of nitrogen increased from 72,000 to 634,500 tons.

Prices of Nitrogen from Various Sources

In 1900 when seven-eighths of all fertilizer nitrogen was derived from natural organics, wholesale prices of both chemical and organic sources were strictly competitive, as shown by Table 3. By 1910, however, total consumption of nitrogen had nearly doubled whereas supplies of the natural organic sources had increased by less than 7 per cent. As a result chemical nitrogen sources had captured almost one-half of the fertilizer market, but because of the general preference for the natural organics these materials were in short supply in relation to the potential market and commanded premium prices.

[3] Rubins, E. J. and Bear, F. E. "Carbon-nitrogen ratios in organic fertilizer materials in relation to the availability of their nitrogen." Soil Sci. 54 (6): 411-423, 1942.

TABLE 3
WHOLESALE PRICES OF NITROGEN IN VARIOUS FERTILIZER MATERIALS[1]

Year	Ammonium sulphate	Sodium nitrate	Ammonia solutions	Natural organics[2]
1900	$2.64	$2.37	....	$2.57
1910	2.97	2.76	....	3.63
1920	4.08	4.44	....	8.71
1930	1.79	2.49	....	4.50
1940	1.37	1.68	$1.22	3.55[3]
1946	1.42	1.75	1.03	3.81[4]

SOURCES: Fertilizers and Lime in the United States. Resources, Production, Marketing and Use. U. S. Dept. Agr. Misc. Pub. 586, 1946. Office of Price Administration. 2nd Rev. MPR 135, 1946.

[1] Average Prices per unit of 20 pounds of nitrogen at producing points or ports in bulk carlots.

[2] Average in animal tankage, dried blood, cottonseed meal, and fish scrap.

[3] Average in animal tankage, castor pomace, cottonseed meal, fish scrap and process tankage.

[4] Average in castor pomace, process tankage, and sewage sludge. OPA ceiling prices.

TABLE 4
RECENT WHOLESALE PRICES OF VARIOUS ORGANIC MATERIALS[1]

Material	Price per unit N
Animal tankage	$10.63
Castor pomace	6.65
Cottonseed meal	12.12
Dried blood	11.54
Fish scrap	13.13
Hoof meal	10.32
Process tankage	5.16
Sewage sludge	4.61
Soybean meal	11.36

[1] Average price per unit of 20 pounds of nitrogen at producing points or ports in bulk carlots, except castor pomace in bags, after adjustment for K_2O and P_2O_5 values where applicable. Oil, Paint and Drug Reporter, 1946, December 30.

The natural organics have continued to command premium prices to date even though they have consistently lost ground to the chemical sources in the proportion of the nitrogen supplied for use both in mixtures and for separate application. The development of higher priced markets for some of the organics as stock feed, as well as the continued demand for natural organics in the formulation of special purpose grades and mixtures, has contributed to the perennial short supply position of the organics and maintenance of a substantial price differential

between the chemical and natural organic sources of nitrogen.

A comparison of the recent wholesale prices of several natural organics, Table 4, shows that only process tankage, sewage sludge and castor pomace can be considered available at prices at which they can be used as fertilizer.

Activity of Water-Insoluble Nitrogen

Owing to the need for control of the quality of the water-insoluble nitrogen content of mixed fertilizers, the Association of Official Agricultural Chemists adopted analytical procedures for determining the solubility of such nitrogen in neutral and alkaline permanganate solutions under closely specified conditions. It was recognized that the solubility values obtained did not relate directly to the percentage availability of the nitrogen to plants, which could only be determined by carefully conducted vegetation experiments, but rather that they would in most cases

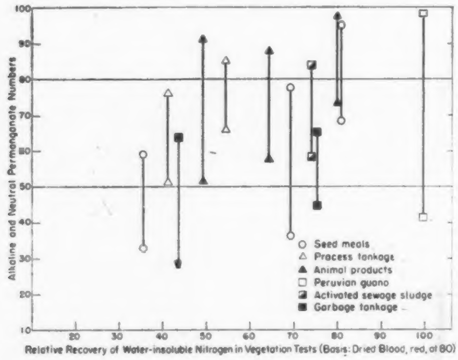


Fig. 1

distinguish between the better and poorer sources of water-insoluble nitrogen. For this purpose any material which exhibited less than 50 per cent solubility by the alkaline method and also less than 80 per cent solubility by the neutral method was classed as inferior.

Haskins and co-workers[4] conducted an extensive series of experiments in the period 1925–1930 at the Massachusetts Agricultural Experiment Station on the various sources of insoluble nitrogen available at that time. They measured both the neutral and alkaline permanganate numbers for each material and determined the availability of its nitrogen to Japanese millet in vegetation pot experiments. The results of this work have been summarized and represented graphically in part in Fig. 1. The alkaline and neutral permanganate numbers are plotted against the relative recovery of the water-insoluble nitrogen in the above ground portion of the plants taking the recovery from red dried blood as 80. Tie lines are used to connect the higher neutral permanganate numbers with the corresponding alkaline permanganate numbers. Various symbols are used to indicate the several types of materials.

It is apparent from this graph that some of the poorer materials would be classed as

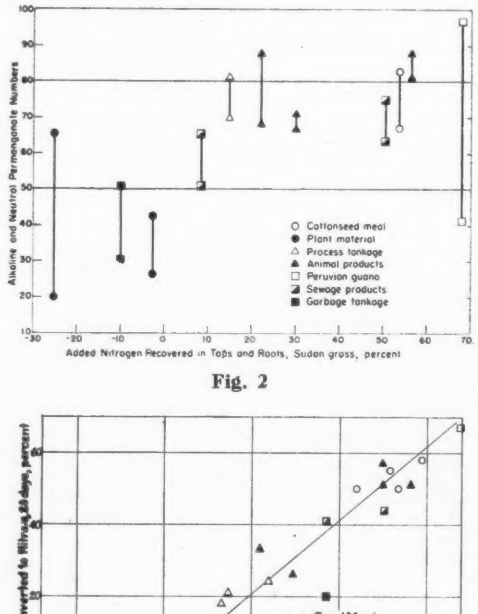


Fig. 2

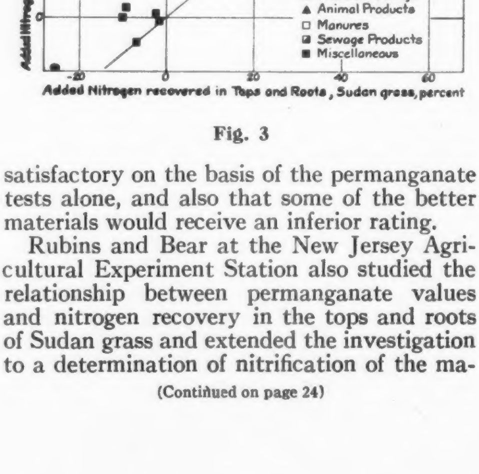


Fig. 3

satisfactory on the basis of the permanganate tests alone, and also that some of the better materials would receive an inferior rating.

Rubins and Bear at the New Jersey Agricultural Experiment Station also studied the relationship between permanganate values and nitrogen recovery in the tops and roots of Sudan grass and extended the investigation to a determination of nitrification of the ma-

(Continued on page 24)

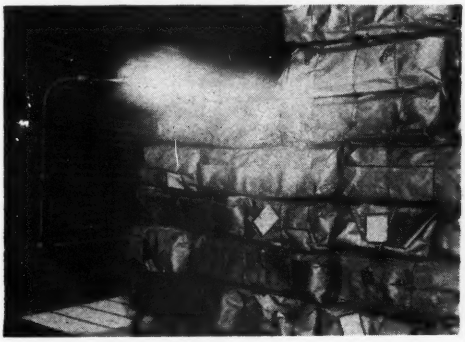
Haskins, H. D. and others. "Inspection of commercial fertilizers." Mass. Agr. Expt. Sta. Control Ser. Bul. 41:32–36, 1927; 45:38–45, 1928; 51:52–58, 1929; 54:46–54, 1930.

Proper Storage of Paper Bags Maintains Strength and Flexibility

Extracted from "How to Get Best Performance from Bemis Paper Bags." Published by Bemis Bro. Bag Company

Paper bags are strongest when they contain the proper amount of moisture. Allowing the moisture content of paper to drop below the normal 6 per cent to 7 per cent means loss of maximum strength, for the bags will dry out, become brittle and lose their ability to "take it." When bag users encounter excessive breakage in the filling process, investigation will usually show that the bags have been stored in dry rooms and have thus been weakened by the loss of their normal moisture content. Restoring this moisture eliminates such breakage.

Why do paper bags dry out? It is because hot, dry air seeks to regain its moisture by stealing it from objects with which it comes in contact that contain relatively more moisture. Dry air in a bag storage room makes up for its lack of moisture by taking it from the bags. Thus, it is important that relative humidity be maintained at a high level. (Relative humidity, expressed in percentages, is the amount of moisture in the air compared to the amount of moisture the atmosphere can hold at a specified temperature. As the temperature drops, the amount of moisture the air can hold decreases.) Storage of paper bags in a humidity of 50 per cent at warm temperature is desirable for maximum absorption of moisture by the paper.



Letting steam escape into paper bag storage rooms increases humidity of the air, prevents drying out and weakening of the paper

Men in charge of paper bag storage will find several simple precautions helpful in maintaining or restoring proper moisture content for best paper bag performance. Avoid storing bags near furnaces, radiators or in rooms where heat is excessive unless the relative humidity is also maintained at a high rate. Don't store bags under roofs where the sun will create a dry "attic heat" that absorbs all moisture from the paper, nor in rooms that are poorly ventilated without proper humidification.

Be especially watchful for dryness in paper bags during extremely hot or extremely cold weather. During cold weather, moisture content of the air may vary suddenly; when it's hot and dry, paper will lose moisture rapidly. Paper bags should not be used immediately after delivery, for often drafts through freight cars lower moisture content during shipping. Upon arrival bags should be stored in a humid room for 24 to 48 hours before filling.

Opening windows on rainy days permits paper bag storage room air to absorb moisture from outside air

After some experience with paper bags, it is not difficult to tell when they have become too dry. One simple test is to shake the bags briskly. If they "rattle" sharply (a condition easily recognized after a few tests) they are too dry for best performance on the packer and should be humidified before using.

(Continued on page 22)

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Vol. 108 FEBRUARY 7, 1948 No. 3

Principal Articles in This Issue

Hands Off, Secretary Harriman

The U. S. Department of Commerce has entered the domestic fertilizer picture with a request, which it has made to Congress, that the Department be given authority to control completely the distribution of all nitrogenous fertilizer materials until March 31, 1950.

The request was contained in a letter to Senator Charles W. Tobey, of New Hampshire, chairman of the senate banking committee, in which Secretary of Commerce W. Averell Harriman inclosed a copy of the administration's bill for compulsory control over distribution of scarce materials. The bill subsequently was introduced by Senator Tobey and referred to his committee. It carries the number S.2023.

At the present time the only controls being exercised over nitrogen are in the case of exports, in accordance with world allocations by the International Emergency Food Committee. The Harriman proposal would continue these controls and extend them to domestic distribution of nitrogen. His letter stated that the authority being sought is complete allocation, including rationing.

"Nitrogenous compounds were included (in the bill) as a result of the studies of our Office of Materials Distribution," the secretary said, "which feels that the granting of this power would assist materially in the production of needed supplies of fertilizer."

It is difficult to see how this proposal by Secretary Harriman would have any effect on the supply of fertilizer nitrogen. Producers of every form of chemical nitrogen are now running their plants to peak capacity and have been for several years past. As fast as the materials are produced, they are shipped to the fertilizer manufacturer as quickly as transportation facilities will permit. The fact that the Department of Commerce would specify where each shipment would go instead of leaving this matter to the distribution plan of the producer himself, would not add one pound to the available supply.

No one objected to rationing during the war emergency period. The plan of fair and reasonable distribution worked out by the Government officials and the fertilizer industry representatives proved generally acceptable. Since allocations on nitrogen were removed after the war, the producers have, with few exceptions, continued the sales of these materials on the same basic principles, so that each fertilizer manufacturer got his share of a necessarily restricted supply. In fact, the principal monkey wrench in the dis-

tribution machinery has been the demands of governmental authorities for additional tonnage for export to satisfy the requirements of the International Emergency Food Committee.

That the present system of nitrogen allocation has proved satisfactory is indicated by the fact that the Department of Agriculture, which is certainly conversant with the fertilizer situation, has consistently recommended against the reinstatement of government distribution controls.

The red tape and voluminous paper work that is always present when a federal bureau handles business matters, should have to be endured only during wartime. Both the fertilizer mixer and the nitrogen producer are looking toward the future, and they can be trusted to solve their present distribution problems satisfactorily without the intervention of Secretary Harriman and his Commerce Department.

Lodge Appointed Assistant to President of N. F. A.

On February 1st, Fred S. Lodge was appointed to the position of assistant to the President of the National Fertilizer Association. Mr. Lodge, who was formerly Technical Assistant of the Association, has served on the staff for the past 14 years. He handles the technical questions presented to the staff and his advice is sought by many units in the industry as well as by public officials throughout the country. Previous to joining the N. F. A. staff, Mr. Lodge was Assistant Director of Production for the Armour Fertilizer Works.

Welsh and Harris Form Own Company

The firm of Welsh, Harris & Co. has been incorporated in New York to handle heavy chemicals, fertilizer materials, animal feeds, greases, fish scrap, fish meal, fish oil and related products. Offices are at 111 Broadway and the telephone number is WOorth 4-5530.

James K. Welsh, the president of the new firm, has transferred to it his business conducted under the name of James K. Welsh Company at 90 West Broadway. Charles M. Harris, secretary and treasurer, severed his connection with the Potash Company of America a few months ago.

Mr. Welsh was a partner in H. J. Baker & Bro., New York, for several years before forming his own firm, whose activities were interrupted by World War II, in which he served as a Colonel. Mr. Harris was with the Potash Company from the time it was formed more than fifteen years ago.

In addition to Mr. Welsh and Mr. Harris, directors of the new company are William T. Pullman and Ralph P. Phillips.

Farm Bureau Again Endorses Senate Fertilizer Bill

At its recent annual convention in Chicago, the American Farm Bureau Federation renewed its support of the National Soil Fertility Bill (S. 1251) which was introduced in the Senate at the last session, and urged that "aggressive steps" be taken to secure its passage.

The bill contains a provision for the construction of a phosphate plant at Mobile, Ala., which is to be operated by TVA for not more than five years and then disposed of to private industry. As it is quite possible that a private company would not be interested in acquiring a plant of the type specified in the bill, it is felt that TVA would continue operation after the five-year period in the event that no purchaser could be obtained.

The Farm Bureau therefore included in their resolution the provision that, if the plant is not sold, it be placed in a stand-by condition. It is doubtful, however, if Congress would be willing for a capital investment of eight or ten million dollars to remain idle under such circumstances.

Lewis Elected President of Longview-Saginaw Lime Works

At a recent meeting of the Longview-Saginaw Lime Works, Birmingham, Ala., Warren Lewis was elected president of the company, to fill the position made vacant by the death of the former president, George A. Brewer. Mr. Lewis, who was formerly vice-president and general manager, has been connected with the lime industry for the past 36 years.

Other officers elected were Mrs. George A. Brewer, chairman of the board; Malone Moore, vice-president and treasurer; Irwin Ehlmann, secretary; E. M. Snow, plant manager.

The company, which was founded in 1874, is a leading producer of lime and lime products for industrial, chemical, structural, as well as agricultural uses.

Fertilizer Tag Sales for 1947 Drop Slightly

Total sales of fertilizer tax tags in the 16 reporting States during 1947 were slightly below sales in 1946. Reports of State control officials to The National Fertilizer Association indicate that annual sales for the recently completed calendar year were equivalent to 1,161,000 short tons, about 1 per cent lower than the 1946 total of 9,276,000 tons which was an all-time high. For each of seven months in 1947 sales were higher than for the same month in 1946. Sales during February and March, however, were noticeably lower than for the corresponding months in 1946, which were the two highest months for that year.

Although tax tag sales during 1947 did not quite reach the peak attained in 1946, they were second to that year. Annual sales for the past 15 years have increased each year, except for 1938 and 1947. Compared with the 1935–1939 average, sales during 1947 were markedly higher for each of the 16 States; the States with the greatest percentage increases, however, are those in which relatively little fertilizer was used during the years 1935–1939.

For the 11 Southern States, total sales for 1947 of 7,163,000 tons were 6 per cent below those for the preceding year. Individually, four of these States reported increases of at least 5 per cent over 1946, while one State showed a very small increase; the other six States recorded decreases ranging from 2 per cent to 22 per cent. The Midwestern States, on the other hand, registered a total increase of 20 per cent, with only one of the

(Continued on page 30)

FERTILIZER TAX TAG SALES
Compiled by The National Fertilizer Association

	December			January–December			
	1947 Tons	1946 Tons	1945 Tons	% of 1946	1947 Tons	1946 Tons	1945 Tons
Virginia	47,016	51,767	25,952	98	657,681	669,437	594,829
N. Carolina	191,199	226,453	179,966	96	1,646,673	1,706,582	1,512,013
S. Carolina	99,600	100,150	63,465	100	943,839	943,550	822,875
Georgia	72,626	83,363	57,720	96	1,091,995	1,135,685	1,105,564
Florida	99,110	90,391	91,478	82	871,991	1,061,073	908,651
Alabama	50,367	81,400	36,650	78	704,252	898,650	722,500
Tennessee	15,881	13,026	3,500	107	353,688	331,265	277,090
Arkansas	22,546	22,900	12,500	105	179,194	171,250	126,650
Louisiana	14,097	12,480	15,550	89	228,700	258,268	239,560
Texas	31,828	46,029	14,630	106	400,691	376,942	229,828
Oklahoma	3,692	5,807	760	143	84,249	58,743	25,072
Total South	647,962	733,766	502,171	94	7,162,953	7,611,445	6,564,632
Indiana	84,842	116,436	60,098	117	800,151	682,366	548,295
Illinois	10,300	23,400	25,850	116	360,895	311,603	257,014
Kentucky	57,101	23,825	11,338	142	465,551	328,881	282,134
Missouri	31,330	28,568	12,620	92	258,674	280,731	160,024
Kansas	8,145	2,485	525	183	112,453	61,353	38,145
Total Midwest	191,718	194,714	110,431	120	1,997,724	1,664,934	1,285,612
Grand Total	839,680	928,480	612,602	99	9,160,677	9,276,379	7,850,244

FERTILIZER MATERIALS MARKET

NEW YORK

Demand for Feeding Organics Slackens Because of Unsettled Market Conditions. Prices Still Above Fertilizer Range. Synthetic Nitrogen Deliveries Cut by Government Requirements. Better Box Car Supply Aids Potash Shipments

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, Febuary 4, 1948.

Organics

The market on tankage and blood remained quiet with small interest being shown by the feed trade, due to the unsettled conditions in some of the commodity markets. Most buyers remained on the sidelines awaiting the outcome of the Marshall Plan and other factors. Tankage and blood were offered at $11.00 ($13.37 per unit N) f.o.b. various shipping points. Vegetable meals for quick shipment were scarce and some sales of linseed meal were made at $115.00 per ton, f.o.b. shipping point. Cottonseed meal and soybean were around $100.00 per ton, f.o.b. production points. Some mills were sold out for several months ahead. Demand from the fertilizer trade for these products was negligible on account of price.

Fish Meal

Several lots of imported fishmeal from Northern countries were reported to have arrived at Atlantic ports. Very little of this is going for fertilizer with the feed trade taking most of it. Offerings were scarce.

Nitrogen Solutions

Domestic buyers received word from their suppliers the past week of a cut-back in allocations of about 25 to 35 per cent of their quotas. This is something the buyers had not figured on and led to a considerable amount of confusion.

Castor Pomace

Production has been reduced at some plants. Supplies are scanty and shipments behind schedule.

Potash

Some producers are able to report shipments going forward on schedule and are rather optimistic, due to better supply of box cars. Some imported material arrived at an Atlantic port but the entire quantity had previously been sold. No information was available as to future shipments of imported potash.

Superphosphate

In certain sections this material was more readily available, but when the heavy spring shipping season gets under way any small surplus will be quickly absorbed.

Sulphate of Ammonia

With practically all producers quoting $40.00 per ton, f.o.b. production point, prices seem to be more uniform than they have been for sometime. Cold weather has cut production at certain plants and shipping difficulties have been encountered which slows the flow of this material to consuming centers.

Hoof Meal

A good demand exists for this material with last sales made at $9.50 f.o.b. shipping points.

Nitrate of Soda

With the demand far exceeding the supply, producers report regular arrivals from South America at various ports. The material is quickly moved out upon arrival.

Ammonium Nitrate

Buyers are very much disappointed at not being able to obtain indicated allotments, and all buyers were cut down because of export requirements made on the producers by the Government.

Bone Meal

A shortage of this material is looked for in the spring months, due to possible meat rationing and other causes. Supplies for prompt shipment were hard to obtain.

Nitrogenous Tankage

Buyers were taking delivery against previous contracts but no additional material was reported available to new buyers.

CHARLESTON

Improvement in Box Car Supply Speeds Material Shipments. Producers in Heavily Sold-Up Condition. Demand Still Exceeds Supply

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, January 31, 1948.

Movement of potash and phosphate rock showed improvement in January, due to better availability of box cars. All prime ingredients continue short of demand; the shortest being in the following order: potash, nitrogen, superphosphate.

Organics.—Demand from the fertilizer trade for organics is in the doldrums, particularly in the Southeast. Some prompt domestic nitrogenous was offered recently at $6.00 and $6.25 ($7.29 and $7.59 per unit N), delivered Southeast port city in bulk.

Castor Pomace.—Movement continues against existing contracts and no new offerings are reported.

Potash.—Shipments during January against contracts are described as satisfactory due to the improvement in the box car situation which is now practically normal. Demand, however, from manufacturers throughout the country remains heavy and supply tight.

Nitrate of Soda.—Demand continues to exceed supply in spite of steady arrivals from Chile. Domestic production continues short of demand, due to insufficient raw materials.

Sulphate of Ammonia.—Prices range from $35.00 to $40.00 per ton in bulk, f.o.b. the ovens, with the majority of producers asking the higher figure. Demand ahead of supply.

Dried Ground Blood.—This market is exceedingly strong with prices ranging from $11.50 to $12.00 per unit of ammonia ($13.98 to $14.59 per unit N), f.o.b. New York and Chicago producing points. In the last day or so, there have been some signs of easing on the prices, but supplies continue short.

Tankage.—This market continues strong, but finds no buyers among the fertilizer trade as feed buyers have bid the prices entirely too high. Price now is around $11.00 per unit of ammonia ($13.37 per unit N), f.o.b. Chicago and Northeast shipping points.

Superphosphate.—Production during November, 1947, was the highest on record, but supplies continue short of demand. There are very few sellers who are not committed for their entire season's output.

Phosphate Rock.—Producers continue in a heavily sold-up position and demand exceeds production facilities. The box car situation has improved, resulting in correspondingly heavier movement to acidulators.

PHILADELPHIA

Little Change in Market Situation. All Materials in Strong Demand with Supplies Moving Mostly on Contract

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, February 2, 1948.

The supply position of practically all fertilizer materials is exceedingly tight, and it is predicted that this situation will continue for another month or two. In fact, it may become tighter.

Sulphate of Ammonia.—The nominal price range continues at $35.00 to $40.00, but the supply is entirely inadequate and resales are possible at much higher figures.

Nitrate of Soda.—Shipments arrive regularly from Chile, but supply is still insufficient to meet the demand.

Ammonium Nitrate.—Demand continues far in excess of production and supply.

Castor Pomace.—No free offerings, and no resales recently.

Blood, Tankage, Bone.—Blood and tankage are not in very abundant supply, and the market keeps strong. Price range is $12.00 per unit of ammonia ($14.59 per unit N), asked, with some business being transacted at $11.50 ($13.98 per unit N). Steamed bone meal has been somewhat easier in supply, with offerings at $50.00 to $53.00 per ton.

Fish Scrap.—Practically no business reported.

Phosphate Rock.—Car supply is better and shipments are moving quite regularly, but supply is unequal to the demand.

Superphosphate.—Movements are principally on contract, with demand for more than can be supplied.

Potash.—This material still remains exceedingly scarce and the resale market is very strong.

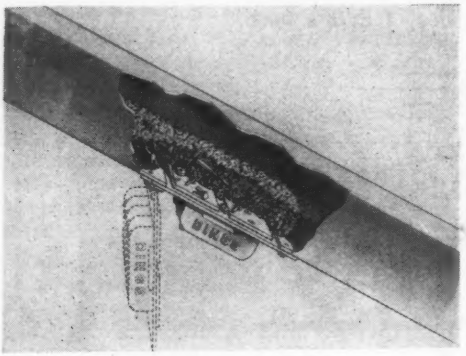
U. S. D. A. Adopts New Policy of Cooperation

The U. S. Department of Agriculture has established a new policy concerning its cooperation with related industries and trade associations with respect to its research activities. A recent opinion of the U. S. D. A. Solicitor permits the establishment of direct cooperative relationship between industrial organizations and the Department and its bureaus. While for many years the fertilizer industry has enjoyed a most cordial and instructive relationship with the U. S. D. A., the new policy now makes it possible for

individual companies to establish special research projects with the Department on a basis similar to those already started with state experiment stations and other research agencies.

Alnico Perma-Plate Magnets

A new line of permanent magnetic separators known as Perma-Plate Magnets to remove tramp iron from materials traveling down chutes or through ducts has been developed by Dings Magnetic Separator Company, 4740 W. McGeogh Avenue, Milwaukee 14, Wisconsin. The magnets are intended for protection of grinders, crushers, stokers, pulverizers and other machinery



Perma-Plate Magnet

susceptible to damage by iron and for purification of such materials as fertilizer, food, feed, grain, coal, etc.

Perma-Plate Magnets consist of a series of "C" shaped Alnico magnets, the poles of which are secured to steel plates and the entire assembly mounted on an aluminum plate. Installation is made by cutting away a section of the bottom of the chute and installing the magnet in its place. The magnet is mounted on hinges so that it can be swung away for removal of collected iron. The steel pole plates project up from the face of the magnet providing edges which help mechanically to arrest and hold the iron.

Standard units are available in a range of sizes four inches to 72 inches wide in increments of two inches. Special magnets can be built to suit requirements. The manufacturer guarantees magnetic permanence of the Alnico magnets for the life of the unit.

Stetson Promoted to Bemis General Production Department

Bradford R. Stetson, superintendent of the Minneapolis bag factory, Bemis Brothers Bag Company, since 1937, has been advanced to the company's General Production Department in St. Louis as office assistant. He took up his new duties January 2.

Mr. Stetson is a graduate of Oberlin College and the Massachusetts Institute of Technology. He joined the Bemis organization in 1927 as a member of the Engineering Department, St. Louis, and in 1930 transferred to Minneapolis. He was an engineer in what has since developed into Bemis Packaging Service, Minneapolis, until his appointment as superintendent of the bag factory there.

Commercial Solvents Expands Agricultural Division

Expansion and reorganization of the Sales Department's Agricultural Division to coordinate the sale of all products entering the agricultural field has been announced by Commercial Solvents Corporation.

Daniel B. Curll, Jr., formerly Manager of the company's Dixie Chemical Division, has been appointed Manager of the enlarged

division. Dr. Hugh R. Stiles becomes Technical Director, and Dr. James G. Sanders continues as entomologist.

Commercial Solvents has been in the agricultural field for many years with its riboflavin feed supplements which find a wide market in the poultry and livestock feed trade. During the past year, the company expanded into the fertilizer and insecticide business.

Late in 1946, the company purchased the Dixie Ordnance Works at Sterlington, Louisiana, which CSC had built and operated for the Government during the war to produce anhydrous ammonia. The major part of the plant's production is used by the Southern farmer after being processed into fertilizer by Gulf Coast manufacturers. During the first year of operation, the selling activities of this unit were handled by the Dixie Chemical Division. The functions of this division have now been taken over by the Agricultural Division.

The most recent development in the agricultural field by Commercial Solvents has been the production of the new, potent insecticide material—benzene hexachloride. A new plant was constructed at Terre Haute, Indiana, in 1947 to produce this product which is sold by CSC to manufacturers of insecticides.

Obituaries

Joseph H. Schmaltz

The fertilizer industry has lost another of its pioneer members through the death on January 29th of Joseph H. Schmaltz of Chicago, well-known broker in fertilizer materials and feedstuffs. Mr. Schmaltz, who has been in poor health for the past year and a half, succumbed to a heart attack at the age of 80 years.

He was connected with the fertilizer industry for 63 years. Prior to World War I he was a partner in the firm of Heller, Hirsh & Company, New York, and the Hygienic Chemical Company. He then opened his own office in Chicago and has been recognized as one of the leading brokers in fertilizer and feed organics.

An associate member of the National Fertilizer Association for more than 30 years, Mr. Schmaltz was a regular attendant at the meetings of the industry until advancing age made it impossible for him to be present. He had a wide circle of friends in the fertilizer business, who sincerely mourn his passing.

Outside of his business activities, he devoted much of his time to certain charitable and philanthropic enterprises in which he took an active interest.

He is survived by his widow, Mrs. Mabel H. Schmaltz, a son, James J. Schmaltz; and two daughters, Mrs. Marian S. Rubel and Mrs. Josephine S. Harris.

Charles W. Dudley

Charles W. Dudley, Office Manager and Chief Accountant of Armour Fertilizer Works at Jacksonville, Florida, died in a local hospital on Friday afternoon, January 23, 1948, following an illness of several weeks. He was 60 years of age and had been connected with Armour Fertilizer Works for 30 years.

Mr. Dudley is survived by his widow; his mother, Mrs. William H. Dudley, of Minneapolis; four children; two brothers; and four sisters. Funeral services were held in Jacksonville on January 26th.

Julian W. Harlan

Julian W. Harlan, Decatur, Georgia, died Wednesday, January 28, 1948, at a private hospital. He was a native of Ottumwa, Iowa, and came to Atlanta in 1901 as Division Credit Manager for Armour Fertilizer Works. Later on he moved to Chicago, but returned to Atlanta in 1932 after his retirement. He had been associated with Armour Fertilizer Works for 30 years. Survivors are his wife, a daughter, Mrs. Louis Rosser, of Cleveland, Ohio; two sons, Judy Harlan, of Atlanta, and Charles Harlan, of Dayton, Ohio; four sisters and one brother.

PROPER STORAGE OF PAPER BAGS MAINTAINS STRENGTH AND FLEXIBILITY

(Continued from page 12)

There are several effective ways of maintaining proper relative humidity in paper bag storage rooms. If steam pipes are available, one way is to let steam escape into the room to keep the air humid. Storage bags on dunnage, away from the floor, and keeping the floor wet will also increase humidity, and it is a good idea to open windows on damp or rainy days so that air in the storage room can absorb moisture from the outside air.

Makeshift humidifiers can be made from barrels. Hang cloths over the edge of a barrel filled with water. The cloth will act as a wick, absorbing water from the barrel and passing it on into the air. A different version of the same thing is to drill small "needle" holes in horizontal water pipes and hang cloths over these holes.

Wetting storage room floors (bags stacked on dunnage) helps keep moisture in the air

Many types of commercial humidifiers are available with capacities to suit individual requirements. When facilities for maintaining proper humidity conditions in paper bag storage rooms are not installed, this automatic equipment will prove to be a profitable investment.

The compressed air type of humidifier requires air under 30 pounds pressure. This air passes through a nozzle with a whirling motion which draws water through the nozzle and expels it in an extremely fine mist. Control may be either manual or automatic.

Low or high pressure steam is used in another type of humidifier. The steam passes through a valve into the path of a fan which mixes it with dry air. Automatic control is maintained by a device which actuates the valve to open and close the steam port.

The centrifugal type humidifier requires only ordinary water pressure for operation. The water feeds onto a whirling disc which converts it into a fine mist by centrifugal force. The mist is blown into the air by a fan attached to the humidifier.

Whether a bagging operation is large or small, reduced breakage and all around more satisfactory performance is obtained when paper bags are given the small additional amount of care necessary to insure proper moisture content. Use the information contained in this article—It pays off!

Needle holes drilled in the water pipe keep these cloths wet and humidify paper bag storage room air

Rags draped over the side of a barrel of water pass moisture into the air of storage rooms

A free copy of "How to Get Best Performance from Bemis Paper Bags" may be obtained by writing to Bemis Brothers Bag Company, 408 Pine Street, Saint Louis 2, Missouri.

USE OF NATURAL ORGANICS IN MIXED FERTILIZERS

(Continued from page 10)

terial in soil media. A comparison of some of their vegetation and permanganate results is given in Fig. 2. Again it will be noted that a few of the better materials fail to qualify as satisfactory by the permanganate methods and some of the poor materials would be rated highly by the tests. This appears to be true particularly for some of the process tankages and sewage products.

The relation between nitrification and recovery by the crop is shown in Fig. 3 which indicates that the amount of nitrogen converted to nitrate form in a given time is a rather reliable index of availability for crop growth.

Quality of Water-Insoluble Nitrogen Mixed in Fertilizers

A general lowering of the quality of the insoluble nitrogen in mixed fertilizers logically might be expected to result from the expanding market for stock feed grades of seed meals and animal products, and from the data in Table 1. In consequence it appeared desirable to evaluate the quality of the water-insoluble nitrogen used in commercial fertilizers in recent years. For this purpose, a co-operative investigation involving 32 mixtures marketed as tobacco or tobacco plant bed fertilizers and 16 mixtures sold as general crop fertilizers in North Carolina was initiated by the North Carolina Department of Agriculture, the North Carolina Agricultural Experiment Station and the Bureau of Plant Industry, Soils, and Agricultural Engineering. A portion of the data secured in that study[5] follows.

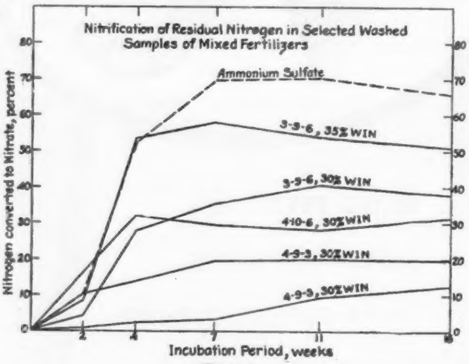


Fig. 4

[5] Constable, E. W., Cummings, R. W., Clark, K. G., and Gaddy, V. L. "Quality of water-insoluble nitrogen in mixed fertilizers." In Analyses of Commercial Fertilizers, Bul. North Carolina Dept. Agr., 1946. December.

In Fig. 4 the nitrification of the insoluble nitrogen in five of the samples is compared with that of ammonium sulphate. Under the conditions of the test the major portion of the nitrification occurred in the 4-week incubation period whether the nitrogen was added in soluble or in insoluble form. The total nitrification observed was much less for the insoluble sources than for ammonium sulphate even at the end of 16 weeks, and wide variations between the relative amounts of nitrogen converted to nitrate form were found for the different insoluble sources.

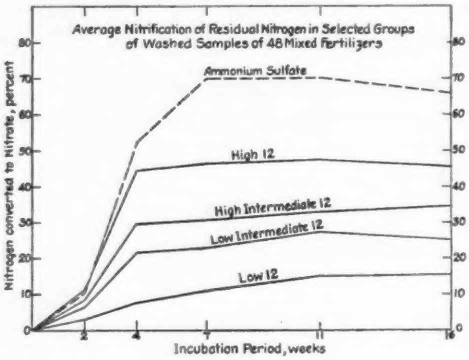


Fig. 5

Fig. 5, although somewhat similar in appearance to Fig. 4, shows the average nitrification of the insoluble nitrogen in the mixtures in high, high-intermediate, low-intermediate, and low groups. The observed nitrification values for the 4-week incubation period were used to classify the 48 mixtures into the respective groups of 12 each. The average nitrification for each group then was determined from the data on the individual samples at the several incubation periods.

A summary of these data are presented in Table 5 which indicates the maximum, minimum, and average nitrification values observed for the groups at each incubation period. The table shows some overlapping of the maximum values for the lower groups over the minimum values for higher groups at incubation periods other than four weeks. This indicates some interchange of individual samples between adjacent groups at the earlier and later periods, but does not alter the conclusions that may be drawn from the work.

The distribution of the samples between the four group classifications is shown in Table 6. Both the tobacco and truck grades as a whole were more or less uniformly distributed. However, the proportion of the tobacco grades in the higher classes increased in general with an increase in water-insoluble nitrogen guarantee.

The results of this study indicate (1) that for 75 per cent of the mixtures 35 per cent or less of the insoluble nitrogen would become available for crop growth in a single season, (2) that the average efficiency of the insoluble nitrogen in the 25 per cent of the mixtures included in the highest classification would

TABLE 5.
SUMMARY OF THE NITRIFICATION OF RESIDUAL NITROGEN IN WASHED SAMPLES OF 48 MIXED FERTILIZERS, BY SELECTED GROUPS

Per cent of added nitrogen converted to nitrate

Group[1]	Incubation period, weeks: 2	4	7	11	16
High Range	3.2–28.9	32.9–55.8	25.0–62.6	29.7–69.4	31.7–59.8
Average	10.8	44.5	46.4	47.4	45.6
High Intermediate Range	1.3–16.7	27.1–32.8	21.6–42.6	23.9–43.5	23.3–48.9
Average	8.3	29.8	30.6	33.0	34.5
Low Intermediate Range	−5.6–16.3	15.8–26.9	13.5–33.9	20.4–36.6	13.8–35.1
Average	6.2	21.7	22.8	27.2	25.1
Low Range	−6.3–10.0	−3.4–15.7	−3.0–19.9	4.0–22.8	4.7–34.1
Average	2.7	7.6	10.8	14.9	15.2
Ammonium sulphate, average	10.3	52.1	69.8	70.2	65.8

not exceed about 70 per cent of the value of nitrogen supplied by ammonium sulphate, and (3) that the relative rate of nitrification of the insoluble nitrogen approximated that of ammonium sulphate and that after conversion to nitrate form it would be subject to proportionate loss by leaching.

TABLE 6.
DISTRIBUTION OF SAMPLES BETWEEN GROUP CLASSIFICATIONS

Water-insoluble nitrogen guarantee, % of total	Total number of samples	Group classification: High	High intermediate	Low intermediate	Low
		Number of samples			
0–10	16	4	5	2	5
20	4	1	–	3	–
25	9	1	1	5	2
30	16	3	6	2	5
35	2	2	–	–	–
40	1	1	–	–	–
Tobacco grades	32	8	7	10	7
All grades	48	12	12	12	12

Possible Savings in the Formulation of Mixed Fertilizer

In view of the generally low efficiency of utilization of natural organic sources of nitrogen, as indicated by the above survey of North Carolina mixtures, it seems desirable to examine the possibilities for reducing the retail price of mixtures through elimination of natural organics from the formula. The simple substitution of one unit of nitrogen from chemical sources for the low-analysis organics without an increase in grade would require from 100 to 200 pounds more filler per ton of mixture. This would limit the possible saving to approximately the price differential between the two forms of nitrogen. However, if the grade were increased simultaneously with the substitution, the reduction in retail price should be considerably greater.

The recent ceilings on retail prices[6] of mixtures provide an excellent basis for the calculation of the possible savings. An intercomparison of the base prices for several

[6] Office of Price Administration. 2nd Rev. MPR 135, Amdt. 6. August 6, 1946.

TABLE 7.
EFFECT OF NATURAL ORGANICS AND GRADE ON RETAIL PRICE OF MIXED FERTILIZERS[1]

Basis: One ton of fertilizer in 100-pound paper bags

Item	3–9–6 Units	3–9–6 Value	Tobacco grade 3–9–6 Units	Tobacco grade 3–9–6 Value	4–12–8 Units	4–12–8 Value
Inorganic nitrogen at $2.40	3	$ 7.20	2	$ 4.80	4	$ 9.60
Natural organic N at $4.95	–	....	1	4.95	–	....
Phosphoric acid (P_2O_5) at $0.75	9	6.75	9	6.75	12	9.00
Potash (K_2O) at $0.75	6	4.20	6	4.20	8	5.60
Potash differential as sulphate		1.15[2]		1.15[2]		1.53[2]
Plant foods	18	19.30	18	21.85	24	25.73
Manufacturing and distribution		12.95		12.95		12.95
OPA ceiling or equivalent, North Carolina	18	32.25	18	34.80	24	38.68
Equivalent price, 24 units plant food	24	43.00	24	46.40	24	38.68
Savings, total		3.40				7.72
Savings, per cent		7.3				16.6

TABLE 8.
POSSIBLE SAVINGS IN THE PURCHASE OF FERTILIZER MIXTURES.[1]
BASE PRICES IN 100-POUND PAPER BAGS

State	Ceiling prices for 24 units plant food as: 3–9–6 Tobacco grade	4–12–8	Saving from purchase of 4–12–8: Dollars	Per cent
South Carolina and Georgia	$46.13	$38.48	$7.85	16.6
North Carolina	46.40	38.68	7.72	16.6
Virginia and West Virginia				
Zone 1	46.93	39.08	7.85	16.7
Zone 2	49.60	41.08	8.52	17.2

grades of mixtures in South Carolina and Georgia, North Carolina, and in Virginia and West Virginia reveals that these prices are based on specific valuations for each of the several kinds of plant food, and that a flat charge has been added to each ton of fertilizer to cover manufacturing and distribution costs. This charge is constant for a particular zone, but varies in the states mentioned from $12.75 per ton in South Carolina and Georgia, and $12.95 in North Carolina to $13.35 and $15.35 in parts of Virginia and West Virginia.

The use of plant food valuations and tonnage charge information derived from ceiling price data permits calculation of the retail prices for a tobacco grade, the same grade without natural organics, and a higher grade without natural organics but carrying the same proportion of potash in sulphate form as the other two. Such calculations for 3–9–6 and 4–12–8 grades are shown for North Carolina in Table 7. The retail price for the 3–9–6 tobacco grade is $34.80 per ton and that for the 3–9–6 without insoluble nitrogen would be $2.55 less owing to the price differential between the chemical and natural organic sources. The price for the 4–12–8 grade is calculated at $38.68 per ton but the cost of 24 units of plant food in the lower tobacco grade would be $46.40 so that the retail price of the 4–12–8 represents a saving of 16.6 per cent or $7.72 per ton. The plant food equivalent to one ton of 3–9–6 then could be purchased at a saving of $5.79 The comparable prices and savings applicable to these grades are slightly lower in South Carolina and Georgia, and somewhat higher in Virginia and West Virginia as shown in Table 8.

Similar savings may be made in the purchase of other grades and ratios in these and other areas whenever the replacement of the high-priced natural organic by lower priced chemical nitrogen also permits an increase in the grade of the mixture. Proportionately larger savings will result where a higher proportion of the total nitrogen has been supplied by natural organics and where it is feasible further to increase the plant-food content of the mixture.

TAG SALES FOR 1947

(Continued from page 14)

five States reporting sales below its 1946 level.

On a monthly basis, tag sales for the 16 States were greatest during January, February and March, in that order. For each month until June, sales were below the preceding month, and then they rose steadily to the end of the year. The heavy demand for fertilizer for spring planting, of course, explains why sales for the first quarter were far greater than for any of the other three quarters. Individually, 10 of the 16 States reported their greatest monthly sales as occurring during January, February or March, while for four States the peak month was either September or November. In Tennessee, however, sales were at their highest during May, and in Kansas during August.

I. C. C. Decision Lowers Industry Freight Charges

A recent decision of the Interstate Commerce Commission has established that the recent increase of 30 cents per ton on freight rates of phosphate rock referred to the type of ton stated in the respective rate and not to a short ton of 2,000 lbs. only. The railroads which raised rates 34 cents on a long ton of 2,240 lbs., must reduce this increase to 30 cents, as granted by the Commission. This seemingly minor difference means a saving to the industry in freight charges of over $100,000 a year.

BUYERS' GUIDE • A CLASSIFIED INDEX TO ALL THE ADVERTISERS IN "THE AMERICAN FERTILIZER"

AMMONIA—Anhydrous and Liquor
Commercial Solvents Corp., New York City
Spencer Chemical Co., Kansas City, Mo.

AMMONIUM NITRATE
Lion Oil Co., El Dorado, Ark.
Spencer Chemical Co., Kansas City, Mo.

BAG MANUFACTURERS—Burlap
Bemis Bros. Bag Co., St. Louis, Mo.
Chase Bag Co., Chicago, Ill.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Virginia-Carolina Chemical Corp., Richmond, Va.

BAG MANUFACTURERS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.
Chase Bag Co., Chicago, Ill.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Virginia-Carolina Chemical Corp., Richmond, Va.

BAG MANUFACTURERS—Paper
Bemis Bro. Bag Co., St. Louis, Mo.
Chase Bag Co., Chicago, Ill.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Hammond Bag & Paper Co., Wellsburg, W. Va.
International Paper Co., Bagpak Div., New York City
Jaite Company, The, Jaite, Ohio
Raymond Bag Co., Middletown, Ohio
St. Regis Paper Co., New York City

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Huber & Company, New York City
McIver & Son, Alex. M., Charleston, S. C.

BAG CLOSING MACHINES
St. Regis Paper Co., New York City
Union Special Machine Co., Chicago, Ill.

BAG PRINTING MACHINES
Schmutz Mfg. Co., Louisville, Ky.

BAGGING MACHINES—For Filling Sacks
Atlanta Utility Works, The, East Point, Ga.
Exact Weight Scale Co., Columbus, Ohio
St. Regis Paper Co., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Company, Boston, Mass.

BONE BLACK
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Huber & Company, New York City

BONE PRODUCTS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BORAX AND BORIC ACID
American Potash and Chem. Corp., New York City

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City.
Keim, Samuel D., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BUCKETS—For Hoists, Cranes, etc.
Hayward Company, The, New York City

BUCKETS—Elevator
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARS AND CARTS
Atlanta Utility Works, The, East Point, Ga.
Hough Co., The Frank G., Libertyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind

CHEMICALS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Commercial Solvents Corp., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill
Lion Oil Company, El Dorado, Ark.
McIver & Son, Alex. M., Charleston, S. C.
Spencer Chemical Co., Kansas City, Mo.
Virginia-Carolina Chemical Corp., Richmond, Va.
Woodward & Dickerson, Inc., Philadelphia, Pa.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Wiley & Company, Baltimore, Md.

CONDITIONERS
American Limestone Co., Knoxville, Tenn.
Jackle, Frank R., New York City.
Keim, Samuel D., Philadelphia, Pa.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Woodward & Dickerson, Inc., Philadelphia, Pa.

CYANAMID
American Agricultural Chemical Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City

DRYERS
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Titlestad Corporation, Nicolay, New York City

FERTILIZER (Mixed) MANUFACTURERS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
International Minerals & Chemical Corporation, Chicago,
Southern States Phosphate & Fertilizer Co., Savannah, Ga
Virginia-Carolina Chemical Corp., Richmond, Va.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

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HOPPERS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Southern States Phosphate & Fertilizer Co., Savannah, Ga.
Woodward & Dickerson, Inc., Philadelphia, Pa.

INSECTICIDES
American Agricultural Chemical Co., New York City

LIMESTONE
American Agricultural Chemical Co., New York City
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Longview-Saginaw Lime Works, Inc., Birmingham, Ala.
McIver & Son, Alex. M., Charleston, S. C.

LOADERS—Car and Wagon
Hough Co., The Frank G., Libertyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making and Handling
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Ammoniating
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, The, East Point, Ga.
Hough Co., The Frank G., Libertyville, Ill.
Hayward Company, The, New York City
Link-Belt Co., Chicago, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, The, East Point, Ga.
Bradley Pulverizer Co., Allentown, Pa.
Pulverizing Machinery Co., Summit, N. J.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Material Handling
Atlanta Utility Works, The, East Point, Ga.
Hayward Company, The, New York City
Hough Co., The Frank G., Libertyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Mixing, Screening and Bagging
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Power Transmission
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Superphosphate Manufacturing
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MANGANESE SULPHATE
McIver & Son, Alex. M., Charleston, S. C.

MINOR ELEMENTS
Agricultural Minerals Co., Montgomery, Ala.
Tennessee Corporation, Atlanta, Ga.

MIXERS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

NITRATE OF SODA
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Il.
McIver & Son, Alex. M., Charleston, S. C.

NITROGEN SOLUTIONS
Lion Oil Company, El Dorado, Ark.
Spencer Chemical Co., Kansas City, Mo.

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J. New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PHOSPHATE ROCK
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Virginia-Carolina Chemical Corp., Richmond, Va.

PLANT CONSTRUCTION—Fertilizer and Acid
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Tilestad Corporation, Nicolay, New York City

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City.

POTASH SALTS—Manufacturers
American Potash and Chem. Corp., New York City
Potash Co. of America, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
United States Potash Co., New York City

PRINTING PRESSES—Bag
Schmutz Mfg. Co., Louisville, Ky.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.

REPAIR PARTS AND CASTINGS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

BUYERS' GUIDE

SCALES—Including Automatic Bagging
- Atlanta Utility Works, The, East Point, Ga.
- Sackett & Sons Co., The A. J., Baltimore, Md.
- Stedman's Foundry and Mach. Works, Aurora, Ind.

SCREENS
- Atlanta Utility Works, The, East Point, Ga.
- Sackett & Sons Co., The A. J., Baltimore, Md.
- Stedman's Foundry and Mach. Works, Aurora, Ind.
- Sturtevant Mill Company, Boston, Mass.

SEPARATORS—Air
- Kent Mill Co., Brooklyn, N. Y.
- Sackett & Sons Co., The A. J., Baltimore, Md.
- Sturtevant Mill Co., Boston, Mass.

SPRAYS—Acid Chambers
- Monarch Mfg. Works, Inc., Philadelphia, Pa.

SULPHATE OF AMMONIA
- American Agricultural Chemical Co., New York City
- Armour Fertilizer Works, Atlanta, Ga.
- Ashcraft-Wilkinson Co., Atlanta, Ga.
- Baker & Bro., H. J., New York City
- Huber & Company, New York City
- Jackle, Frank R., New York City.
- McIver & Son, Alex. M., Charleston, S. C.
- Woodward & Dickerson, Inc., Philadelphia, Pa.

SULPHUR
- Ashcraft-Wilkinson Co., Atlanta, Ga.
- Texas Gulf Sulphur Co., New York City

SULPHURIC ACID
- American Agricultural Chemical Co., New York City
- Armour Fertilizer Works, Atlanta, Ga.
- Ashcraft-Wilkinson Co., Atlanta, Ga.
- Baker & Bro., H. J., New York City
- Huber & Company, New York City
- International Minerals & Chemical Corporation, Chicaro, Ill.
- McIver & Son, Alex. M., Charleston, S. C.
- Southern States Phosphate Fertilizer Co., Savannah, Ga.
- U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
- Virginia-Carolina Chemical Corp., Richmond, Va.

SUPERPHOSPHATE
- American Agricultural Chemical Co., New York City
- Armour Fertilizer Works, Atlanta, Ga.
- Ashcraft-Wilkinson Co., Atlanta, Ga.
- Baker & Bro., H. J., New York City
- Huber & Company, New York City
- International Minerals & Chemical Corporation, Chicago, Ill.
- Jackle, Frank R., New York City.
- McIver & Son, Alex. M., Charleston, S. C.
- Southern States Phosphate Fertilizer Co., Savannah, Ga.
- U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
- Virginia-Carolina Chemical Corp., Richmond, Va.

SUPERPHOSPHATE—Concentrated
- Armour Fertilizer Works, Atlanta, Ga.
- International Minerals & Chemical Corporation, Chicago, Ill.
- U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
- Virginia-Carolina Chemical Corp., Richmond, Va.

TAGS
- Keener Mfg. Co., Lancaster, Pa.

TANKAGE
- American Agricultural Chemical Co., New York City
- Armour Fertilizer Works, Atlanta, Ga.
- Ashcraft-Wilkinson Co., Atlanta, Ga.
- Baker & Bro., H. J., New York City
- International Minerals & Chemical Corporation, Chicago, Ill.
- Jackle, Frank R., New York City.
- McIver & Son, Alex. M., Charleston, S. C.
- Woodward & Dickerson, Inc., Philadelphia, Pa.

VALVES
- Atlanta Utility Works, The, East Point, Ga.
- Monarch Mfg. Works, Inc., Philadelphia, Pa.

Alphabetical List of Advertisers


Improved Manufacturing Operations and
Larger Yields of Quality Crops
BOTH—with INTERNATIONAL POTASH
INTERNATIONAL POTASH
You and your customers both benefit when you use International Potash. It enables you to cut costs and speed manufacturing operations—and produce quality fertilizers which will help your farm customers get larger, more profitable crop yields.
Many fertilizer plant operators tell us they like the unusual mechanical condition of International Potash. They appreciate the free-flowing characteristics of its clean, dry granular crystals. Its workability is an important factor in unloading, mixing, bagging.
International Potash is produced from our mines at Carlsbad, New Mexico, and is available in the grades you need to produce quality fertilizers that will satisfy the demand of the farmers you serve.
MURIATE OF POTASH • SULPHATE OF POTASH
SUL-PO-MAG (Water-Soluble Sulphate of Potash-Magnesia)
POTASH DIVISION
International
MINERALS & CHEMICAL CORPORATION
General Offices: 20 North Wacker Drive, Chicago 6
Sales Offices: 61 Broadway, New York 6, N. Y.; Chicago 6; Volunteer Bldg., Atlanta 3, Ga.

, Ga.